AN INTERNATIONAL AWARD-WINNING INSTITUTION FOR SUSTAINABILITY

DEPARTMENT OF BASIC MEDICAL SCIENCES

KULLIYYAH OF MEDICINE

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

BIOCHEMISTRY STUDY GUIDE

Academic Session 2022/2023

Updated: March 2023

MASTER OF MEDICAL SCIENCES, MASTER OF HEALTH SCIENCES & PhD IN HEALTH SCIENCES

Senate Endorsement Master of Medical Sciences:
25th March 2022 (486th Senate Meeting)
Senate Endorsemen of Master & PhD of Health Sciences:
24th December 2021 (483rd Senate Meeting)

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GENERAL CONTENTS

Any absence due to sickness or any unforeseen circumstances must be notified to the course coordinators as soon as possible and must be supported by suitable documentation e.g. sick certification

BIOCHEMISTRY

Directory of Course Instructors

No.	Name	Email	Department
1.	Assoc. Prof. Dr. Nor Zamzila Abdullah	zamzila@iium.edu.my	Pathology & Laboratory Medicine, KOM
2.	Prof. Dr. Sirajudeen Kuttulebbai Naina Mohamed Salam	knssiraj@iium.edu.my	Basic Medical Sciences, KOM
3.	Asst. Prof. Dr. Noraihan Mat Harun	noraihan@iium.edu.my	Basic Medical Sciences, KOM
1.	Asst. Prof. Dr Nurul Ashikin Muhammad Musa	nurulashikin@iium.edu.my	Basic Medical sciences, KOM

List of Courses

	Course Title	Course Code	Course Classification	Credit Hours
1.	Introduction to Medical Biochemistry	BIOC 7231	Special Req	2
2.	Regulation of Metabolism in Human	BCH 7332	Core	3
3.	Medical Enzymology	BIOC 7333	Core	3
4.	Basic Genetics of Human Disease	BCH 7334	Core	3

BIOC 7231: Introduction to Medical Biochemistry

Course Coordinator: Asst. Prof. Dr. Noraihan Mat Harun

Section 1: Course Synopsis

This course introduces students to the basic physical and chemical properties of enzymes, carbohydrates, lipids, proteins, hormones and some aspects of molecular biology that are important for students in this field to master before he/she can pursue research in this area. Relevant ethical and Islamic issues in medical biochemistry will also be highlighted.

Section 2: Learning Outcome

1. Organize the classification, structure and functions of different types of carbohydrates, amino acids, proteins and lipids.
2. Arrange the enzymes with regards to their classification, properties, mechanism of action and factors affecting the enzyme kinetics.
3. Compare and contrast the metabolisms of various hormones and their mechanisms of action.
4. Organize the basic structure of DNA and RNA, mechanism of DNA replication, RNA synthesis and protein synthesis.
5. Appraise the importance and application of basic biochemistry and molecular biology in medicine.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Assignment
3. Seminar
4. Practical
5. Self-directed learning

Section 4: Course Assessment

Assignment	30%
Seminar	30%
Viva	30%
Participation/Attendance	10%

Section 5: Course Content

No.	Topic
1.	• Basic Enzymology • Enzymes in Medicine
2.	• Amino acids • Proteins
3.	• Carbohydrates Metabolism • Blood sugar regulation
4.	Fatty acids & Triglycerides
5.	• Lipoproteins • Phospholipids
6.	• Nucleotides • DNA
7.	RNA & Protein Synthesis
8.	• Basic Endocrinology • Hormones

Section 6: Learning Resources

Required Textbook

1. Emine Ercikan Abali, et. al. (2021). Lippincott's Illustrated Reviews: Biochemistry (8th Edition). Philadelphia: Wolters Kluwer.

Recommended Textbook

1. Michael A. Lieberman, Alisa Peet (2022) Marks's Basic Medical Biochemistry: A Clinical Approach (6th Edition). Philadelphia: Wolters Kluwer.
2. Peter J. Kennelly, et. al. (2022). Harper's Illustrated Biochemistry (32nd Edition). USA: McGraw Hill.

BIOC 7332: Regulation of Metabolism in Human

Course Coordinator: Asst. Prof. Dr. Noraihan Mat Harun

Section 1: Course Synopsis

The regulation of metabolism with respect to multienzyme systems, allosteric enzymes, factors and mechanisms regulating individual enzyme as well as action of hormones that regulate the metabolic processes and their associated disorders in humans are emphasized in this course. These are important for students in biochemistry to master before he/she can pursue any research in this area. Relevant ethical and Islamic issues will also be highlighted.

Section 2: Learning Outcome

1. Classify, compare and contrast the pathways of carbohydrate, lipid, amino acid and nucleic acid metabolisms and their regulation.
2. Evaluate integration of metabolisms at the intracellular, intercellular and inter-organ levels.
3. Appraise the importance and application of regulations of human metabolism in medicine.
4. Relate the knowledge in regulation of metabolism in research works.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Assignment
3. Tutorial
4. Seminar
5. Practical
6. Self directed learning

Section 4: Course Assessment

Assignment	30%
Seminar	30%
Examination	30%
Participation/Attendance	10%

Section 5: Course Content

No.	Topic
1.	Regulation of Carbohydrate Metabolism
2.	Oxidative Phosphorylation and Electron Transport Chain
3.	Maintenance of Blood Glucose Levels
4.	Regulation of Protein and Amino Acid Metabolism
5.	Detoxification of Ammonia
6.	Synthesis of Specialized Biomolecules
7.	Regulation of Fatty Acid and Triglyceride Metabolism
8.	Regulation of Lipoprotein & Cholesterol Metabolism
9.	Regulation of Complex Lipid Metabolism
10.	Integration of Metabolism
11.	Regulation of Nucleotide Metabolism
12.	DNA Structure and Replication
13.	RNA Structure and Synthesis
14.	Protein Synthesis

Section 6: Learning Resources

Required Textbook

1. Emine Ercikan Abali, et. al. (2021). Lippincott's Illustrated Reviews: Biochemistry (8th Edition). Philadelphia: Wolters Kluwer.
2. Michael A. Lieberman, Alisa Peet (2022) Marks's Basic Medical Biochemistry: A Clinical Approach (6th Edition). Philadelphia: Wolters Kluwer.
3. Peter J. Kennelly, et. al. (2022). Harper's Illustrated Biochemistry (32nd Edition). USA: McGraw Hill.

Recommended Textbook

1. Delvin, T.M. (2019). Text book of biochemistry with clinical correlation (8th Revised Edition.). John Wiley & Sons Inc.

BIOC 7333: Medical Enzymology

Course Coordinator: Prof. Dr. KNS Sirajudeen

Section 1: Course Synopsis

This course focuses on the basics of enzymes that include nature of these catalytic molecules, intracellular and extracellular enzymes, isoenzyme and their mechanisms of action. The use of enzymes as diagnostic tools, therapeutic, tumor markers, follow-up, prognosis and as reagent in bio-assay (antigens) is also emphasized. These are important for students in biochemistry to master before he/she can pursue research works in this area. Relevant ethical and Islamic issues will also be highlighted.

Section 2: Learning Outcome

1. Point out and analyze the basic principle of clinical enzymology, factors that affect the enzyme levels in blood, the importance of enzymes and their clinical significance.
2. Compare and contrast the physiological actions, tissue distribution, clinical significance and methods of analysis of various enzymes that are medically important.
3. Compare and contrast the different types of isoenzymes, their methods of analysis and interpretation.
4. Integrate the knowledge and skills acquired in biochemistry research.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Assignment
3. Tutorial
4. Seminar
5. Practical
6. Self directed learning

Section 4: Course Assessment

Assignment	30%
Seminar	30%
Examination	30%
Participation/Attendance	10%

Section 5: Course Content

No.	Topic
1.	Introduction to Medical Enzymology
2.	Enzyme Kinetics
3.	Enzyme Kinetics (Practical)
4.	Liver Enzymes
5.	Liver Enzymes (Practical)
6.	Muscles Enzymes
7.	Pancreatic Enzymes
8.	Pancreatic Enzymes (Practical)
9.	Bone Enzymes
10.	Bone Enzymes (Practical)
11.	Red Cell Enzymes
12.	Red Cell Enzymes (Practical)
13.	Isoenzymes
14.	Other enzymes of Clinical Utility

Section 6: Learning Resources

Required Textbook

0. Rifai, N., Horvath, A. R., & Wittwer, C. T. (2018). Tietz fundamentals of clinical chemistry and molecular diagnostic (8th ed.). St. Louis, Missouri: Elsevier Saunders
1. Rifai, N., & Gay-Lussac, J. L. (2018). Tietz textbook of clinical chemistry and molecular diagnostics (6th Edition.). Elsevier Saunders.

Recommended Textbook

1. Delvin, T.M. (2019). Textbook of biochemistry with clinical correlation (8th Revised Edition.). John Wiley & Sons Inc.

BIOC 7334: Basic Genetics of Human Disease

Course Coordinator: Asst. Prof. Dr. Nurul Ashikin Muhammad Musa

Section 1: Course Synopsis

This course covers molecular biology, application of the science of DNA in health and disease as well as biotechnology and genetic engineering that are important for students in this field to master before he/she can pursue research in this area. Relevant ethical and Islamic issues will also be highlighted.

Section 2: Learning Outcome

1. Classify the different types of mutations in relation to the structures and functions of the different genes
2. Appraise the molecular basis of diseases and their applications in medicine.
3. Compare and contrast different techniques in gene therapy.
4. Appraise the application of molecular genetic techniques in research works.

Section 3: Teaching Format and Guidelines

1. Lecture
2. Assignment
3. Tutorial
4. Seminar
5. Practical
6. Self directed learning

Section 4: Course Assessment

Assignment	30%
Seminar	30%
Examination	30%
Participation/Attendance	10%

Section 5: Course Content

No.	Topic
1.	Overview of Human genetics
2.	Structure and Function of Genes and Chromosomes.
3.	Gene Expression and Regulation.
4.	Gene Mutation, Recombination and Repair.
5.	Tools in Molecular Genetics
6.	Microarray Technology
7.	Pharmacogenetics
8.	Guide on Genetic Database
9.	Genetic Diseases
10.	Genetic Diseases (Practical)
11.	Gene Therapy
12.	Genetics of Cancer
13.	Genetics Screening
14.	Genetics Diagnosis

Section 6: Learning Resources

Required Textbook

1. Brooker, R. J. (2021). Genetics, analysis and principles (7th Edition.). Mc Graw-Hill.
2. Bruce, R. K., & Mira, B. I. (2013). Human genetics and genomics (4th Edition.). Wiley-Blackwell.

Recommended Textbook

1. Jorde, L. B., Carey, J. C., & Bamshad, M. J. (2019). Medical genetics (6th Edition.). Elsevier.
2. Pierce, B. A. (2019). Genetics: A conceptual approach (7th Edition.). W.H. Freeman & Company.